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13. ABSTRACT (Maximum 200 words) A variety of new processes and materials for nanoscale magnetic devices has been developed under this 5-year program, with application to non-volatile magnetic memories and GMR/spin-valve heads. The demonstration of ultra-high density patterning techniques and magnetic dot arrays were highlights of the program.			
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**Final Report**  
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**Nanoscale Devices and Novel Engineered Materials**  
**DOD/AFOSR MURI**  
**Grant Number F49620-96-1-0026**

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## Major Accomplishments for MURI "Nanoscale Devices and Novel Engineered Materials"

- (i) Development of new ballistic electron focusing device with potential for detection of magnetic switching of isolated nanoparticles.
- (ii) New understanding of the magnetization reversal mechanism in nanoscale particle arrays.
- (iii) CMR oxides with improved thermal performance.
- (iv) Proved long-term mechanical and magnetic performance of dry etched MRAM stacks.
- (v) Fabrication of hybrid ferromagnet/semiconductor device.
- (vi) High quality IBD multilayers.
- (vii) Advanced mechanical property measurements using capacitive force modulation.
- (viii) Installation and operation of novel Kerr probe for magneto-optical measurements on ultra-high fields (30T) at NHMFL.
- (ix) Highly accurate models of transport in magnetic multilayers.
- (x) Fundamental studies of the magnetic proximity effect.
- (xi) Tunneling studies in magnetic semiconductors and CMR materials.
- (xii) Fabrication and magneto-transport on 1D magnetic structures.
- (xiii) PLD of high quality  $\text{PrBaCaMnO}_x$  and  $\text{LaCaMnO}_x$  CMR thin films.
- (xiv) CPP and CIP  $\text{NiMnSb}$  spin valves.
- (xv) Development of high density etch processes for GMR and CMR materials using corrosive ( $\text{Cl}_2/\text{Ar}$ ,  $\text{ICl}/\text{Ar}$ ,  $\text{IBr}/\text{Ar}$ ) and non-corrosive ( $\text{CO}/\text{NH}_3$ ) plasma.
- (xvi) Reproducible fabrication process for forming 1-D magnetic structures.
  - transport properties of 75 nm nanowires.
- (xvii) Developed low temperature deposition (250-300°C) of  $\text{NiMnSb}$  spin polarized magnetic layers.
  - measured saturation magnetization and coercivity for  $\text{NiMnSb}/\text{Cu}$  multilayers (Cu superior to Ag).
  - Trilayer spin valves ( $\text{NiMnSb}/\text{Cu}/\text{NiMnSb}/\text{FeMn}$ ); CIP, CPP measurements.
- (xviii) MBE capability for magnetic thin films.
- (xix) Measured blocking temperature and coercivity of granular ( $\text{Co}_{25}\text{Cu}_{75}/\text{Cu}$ ) multilayers ( $t_{\text{Cu}}$  0-50Å,  $t_{\text{G}}$  5-250Å).
  - magnetic properties can be engineered by modifying local environments of Co particles (GMR increases 2x from 0-2 nm Cu spacing).
- (xx) Developed processing techniques for fabrication of ultra-high density MRAMs based on GMR multilayers.
  - > 64 Gbit/in<sup>2</sup> pattern density.
- (xxi) Measured electron transport properties of rare earth hexaboride magnetic semiconductors.
  - accepted model of d and f band hybridization needs modification (lattice

- distortion → indirect gap → controls electron tunneling)
- (xxii) Theory of electron transport in magnetic structures.
  - GMR is reduced as width of laterally confined multilayers is decreased (could be enhanced with a strongly spin-dependent scattering surface).
  - effect of spin flip scattering on CIP GMR.
  - full quantum microscopic calculations (effect of interface coatings, Schuller experiments on very clean multilayers).
  - magnetic tunnel junctions.
- (xxiii) High resolution lift-off process for 0.5μm CD features on large wafer areas.
  - tested with several different materials and film deposition techniques.
- (xxiv) High resolution TEM analysis capability.
  - FIB sample preparation.
- (xxv) STM fabrication of nm scale Fe particle arrays.
  - growth into Hall Gradiometer.
- (xxvi) Fabrication of self-focusing 2DES structures.
- (xxvii) Dry etch mechanism and processes for patterning of NiFe, Cu, LaMnO<sub>3</sub>, SmCo, NiMnSb using high density plasmas.
- (xxviii) Observation of interactions between submicron magnetic structures with flux lattice of superconductor.
- (xxix) Transport measurements in lines of submicron Co dots.
- (xxx) Demonstration of fabrication by micro-MOCCVD of magnetic Fe nanoparticles (MFM) microscopy shows ferromagnetism at room temperature). Studies of these particles, either in isolation or arrays, are intended to probe the limits to recording densities using magnetic particulate media.
- (xxxi) Design, fabrication (FSU-UF collaboration), and characterization of semiconductor heterostructure focusing geometries for integration with magnetic nanostructures. These geometries offer the possibility of dynamic switching experiments on single particles.
- (xxxii) Use of the highest sensitivity microcalorimeter to measure the specific heat of a thin film antiferromagnet. This will be applies to studies of materials important in exchange biased systems.
- (xxxiii) Developed methods for the growth of single crystal epitaxial Co-Pt thin films of variable composition and Curie temperature. These will be incorporated in tunnel junction devices in the future.
- (xxxiv) Developed the preparation of submicron magnetic microstructures in a variety of geometric configurations using electron beam lithography. This was applied to study the dynamical locking of vortices in Nb. A number of novel magnetic applications are being explored.
- (xxxv) Commenced evaluation of polymer fiber-optic applications of nanocluster metal-polymer composites.
- (xxxvi) Developed plasma etching processes for magnetic films and Giant Magneto-Resistance structures (NiFeNiFeCo) for next generation rad-hard high density magnetic memories and sensors. The films were obtained from Honeywell Solid State Electronics Center (A.J. Hurst, MRAM Technical Director) and these materials will be the basis for replacement MRAM devices for system insertion by Honeywell Space Systems (A. Springer, Principal Engineer).

- (xxxvii) Direct fabrication of sub-micron magnetic patterns using collimated sputter deposition and electron-beam-processed mask. This technique, developed under the MURI, will be extended through a Honeywell sub-contract, to establish limits of miniaturization for GMR sense lines in MRAM devices.
- (xxxviii) E-beam patterning
  - high density using lift-off: minimum feature size 200Å, spacing 400Å
  - low density using novel masks, control of e-beam spread: minimum feature size < 100Å
- (xxxix) Examined effect of lateral confinement on GMR. Typically the GMR is decreased with confinement, unless the sides are very smooth (specular scattering). Controlling surface disorder is very important.
- (xl) Produced three modeling tools: Boltzmann equation in multilayer, Boltzmann equation in laterally confined multilayers and impurity averaged Green functions/Multilayer Boltzmann equations. These will work on Unix, PC and Mac platforms. (Need Matlab and also Fortran for the accelerated version).
- (xli) Evaluated different approaches to GMR in multilayers. With the impurity averaged green functions/Multilayer Boltzmann equation we believe we can calculate GMR with realistic electronic structure up to 100 layer unit cells
- (xlii) Fabrication of a semiconductor FET with ferromagnetic contacts.
- (xlili) Study of the effects of UV illumination on the etch mechanism of magnetic materials.
- (xliv) Long-term stability of dry etched MRAM stacks.
- (xlv) Patterning of new storage capacitor materials for DRAM.
- (xlvi) Novel mechanism for ferromagnetism in  $\text{CaB}_6$ .
- (xlvii) Magnetization reversal in magnetic nano-particle arrays.
- (xlviii) Screening length determination in tunnel junctions.
- (xlix) Hysteresis and relaxation phenomena in GMR multilayers.
- (l) Particle size dependence of superparamagnetic-ferromagnetic transition in Ni.
- (li) Proximity effects in magnetic/nonmagnetic systems.
- (lii) Tunnelling magnetoresistance in GMR/CMR structures.
- (liii) Chemisorption of halogens on metals as a precursor to etching.
- (liv) Mechanical properties of nanowires.
- (lv) Size effects in magnetic and superconducting materials.
- (lvi) Optimized ion beam deposition of GMR multilayers.
- (lvii) Theory of maximum-possible GMR effect.

## Technology Highlights

1. Discovered a dry etching process for NiFe and related alloys based on a balance between chemical surface reaction with Cl, and ion-assisted desorption of the reaction products, followed by *in-situ* removal of chlorine residues to prevent corrosion. This is being transitioned to Honeywell for use in fabricating high density, rad-hard, non-volatile Magnetic Random Access Memories (MRAMs).
2. Growth of the first high quality, potentially 100% spin-polarized NiMnSb thin films at low (250°C) temperatures. These are attractive candidates for advanced magnetic storage devices with improved Giant Magneto-Resistance response.
3. Development of techniques for reducing the ultimate limits of e-beam lithography, and resultant achievement of individual features with dimension  $< 300\text{\AA}$ , and dense arrays ( $> 10\text{ Gbits-in}^2$ ) of 500 Å features for next generation information storage devices.
4. Growth of improved SrS:Ce, F thin films which emit in the blue, using addition of GaS during rf-magnetron deposition. These have application for full color electroluminescent displays. A plasma etching process for patterning of these films has also been discovered (work done in collaboration with Planar Systems, the only domestic supplier of EL displays).
5. Use of novel, non-corrosive etching chemistries (e.g. Co/NH<sub>3</sub>) for magnetic materials (NiFeCo, FeAlN, CoCu), with application to read/write heads (in conjunction with Plasma-Therm, a manufacturer of etching systems, and Seagate, a manufacturer of computer hard drives).
6. Ultra-high density patterning process ( $> 64\text{ Mbit-in}^{-2}$ ) based on e-beam lithography for future generations of rad-hard, infinitely rewritable Magnetic Random Access Memories (MRAMs) – work done in collaboration with Honeywell Solid State Technology Center, MN.
7. Growth of high quality CoFeB and low temperature NiMnSb thin films ( $< 250^\circ\text{C}$ ), both of which are attractive candidates for next generation information storage devices – work done in collaboration with IBM Almaden Research Center, San Jose, CA.
8. Development of the non-corrosive Co/NH<sub>3</sub> plasma chemistry for shallow feature etching (e.g. MRAMs) – work done in conjunction with Plasma-Therm, St. Petersburg, FL and Seagate, MN.
9. Development of new Kerr probe for ultra-high B field magneto-optical measurements – work done in conjunction with National High Magnetic Field Laboratory, Tallahassee, FL, where the probe is available as a user facility.

10. Maskless approaches to ultra-high density patterning for future generations of rad-hard, infinitely rewritable Magnetic Random Access Memories (MRAMs) – work initiated in collaboration with Honeywell Solid State Technology Center, MN.
11. Discovered a dry etching process for NiFe and related alloys based on a balance between chemical surface reaction with Cl, and ion-assisted desorption of the reaction products, followed by *in-situ* removal of Chlorine residues to prevent corrosion. This is being transitioned to Honeywell for use in fabricating high density, rad-hard, non-volatile magnetic Random Access Memories (MRAMs).
12. Growth of the first high quality, potentially 100% spin-polarized NiMnSb thin films at low (250°C) temperatures. These are attractive candidates for advanced magnetic storage devices with improved Giant Magneto-Resistance response.
13. Development of techniques for reducing the ultimate limits of e-beam lithography, and resultant achievement of individual features with dimension  $< 300\text{\AA}$ , and dense arrays ( $> 10\text{ Gbits}\cdot\text{in}^{-2}$ ) of  $500\text{\AA}$  features for next generation information storage devices.
14. Growth of improved nanoscale SrS:Ce, F thin films which emit in the blue, using addition of GaS during rf-magnetron deposition. These have application for full color electroluminescent displays. A plasma etching process for patterning of these films has also been discovered (work done in collaboration with Planar Systems, the only domestic supplier of EL displays).
15. Customer: UNAXIS USA, Inc., 10050 16<sup>th</sup> Street North, St. Petersburg, FL 33716.  
Contact: Jewon Lee, 727/577-4999  
Result: A process for *in-situ* removal of chlorine or other corrosive gas residues from the surface of plasma-etched magnetic structures. The process involves a short post-etch exposure to a hydrogen plasma, which removes the etch residues. The completed structures can then be removed from the etch chamber and exposed to air. We have found that this procedure eliminated corrosion of the magnetic multilayers comprising the magnetic structure.  
Application: To continue the advances in magnetic data storage and magnetic random access memories, it is necessary to use the high yield etching processes from the Si chip industry to make smaller, higher density magnetic elements. A problem to date in etching the metal layers that comprise magnetic structures has been post-etch corrosion from residues left on the surface. Our process solves this problem.
16. Customer: Army Research Lab (European Research Office), 223 Old Marylebone Road, London NW1 5<sup>TH</sup>, United Kingdom  
Contact: John Zavada 011-44-171-514-4907

Result: A method for making magnetic semiconductors, such as GaMnN, by high dose implantation of Mn ions and subsequent annealing. The resultant material retains the electrical and optical properties of the host semiconductor, but also has magnetic properties such as ferromagnetism. This enhances the functionality of the material, by having electrical, optical and magnetic properties on the same chip.

Application: Spin-electronics, in which the spin of the electron is utilized in addition to its charge. This should enable a new class of electronics for low power, high-density memories.

## **Interactions and Industrial Contacts**

1. IBM Almaden Research Center, San Jose, CA – new nanoscale materials and processes for computer hard devices
2. Honeywell Solid State Electronics Center, Plymouth, MN – new processes for radiation-hard memory.
3. Honeywell Space Systems, Clearwater, FL – next generation MRAM for use in submarine-based missile systems.
4. Plasma-Therm, St. Petersburg, FL – new etch processes for magnetic materials.
5. Seagate, Minneapolis, MN – new etch processes for magnetic material.
6. IBM T.J. Watson Research Center, Yorktown heights, NY - new etch processes for magnetic materials.
7. Motorola, Tempe, AZ – advanced processing for MRAM.
8. Bell Laboratories, Lucent Technologies – deposition/etching of advanced dielectrics for memory devices.
9. Piezo Technology, Inc., Orlando, FL – characterization/etching of new oxides for ultra-precise timing applications (oscillators).
10. Corning, Corning, NY – advanced dielectrics for magnetic sensors.
11. Naval Research Laboratory, Washington, DC – methods for measuring mechanical properties at the nanoscale, and fabrication of spin-FETs.
12. Sandia National labs, Albuquerque, NM – high rate etching processes for magnetic multilayers.
13. Allied Signal, Columbia, MD – e-beam lithography for ultra-dense patterning.
14. American Crystal Technology, Fremont, CA – growth of dilute magnetic semiconductors.
15. US Army Research Lab, Adelphi, MD – magnetic sensors.

## Refereed Publications

"Comparison of Dry Etching Techniques for III-V Semiconductors in CH<sub>4</sub>/H<sub>2</sub>/Ar Plasmas," S.J. Pearton, J.W. Lee, E.S. Lambers, C.R. Abernathy, F. Ren, W.S. Hobson and R.J. Shul, J. Electrochem. Soc., 143, 752 (1006).

"High Microwave Power ECR Etching of III-V Semiconductors in CH<sub>4</sub>/H<sub>2</sub>/Ar," S.J. Pearton, J.W. Lee, E.S. Lambers, J.R. Mileham, C.R. Abernathy, W.S. Hobson, F. Ren and R.J. Shul, J. Vac. Sci. Technol. B 14, 118 (1996).

"Etching of InP at >1 $\mu$ m/min. in Cl<sub>2</sub>/Ar Plasma Chemistries," J. W. Lee, J. Hong and S. J. Pearton, University of Florida, Gainesville FL 32611, Appl. Phys. Lett. 68, 847 (1996)

"Electron Cyclotron Resonance Plasma Etching of InP and Related Materials in BCl<sub>3</sub>," F. Ren, W. S. Hobson, J. M. Kuo, J. R. Lothian and J. Lopata, S. J. Pearton and J. A. Caballero, Solid-state Electronics 39, 696 (1996)

"Investigation of Masking Materials for High Ion Density Cl<sub>2</sub>/Ar Plasma Etching of GaAs," J. W. Lee and S. J. Pearton, Semicond. Sci. Technol. 11, 812 (1996)

"Cl<sub>2</sub>-Based Dry Etching of GaAs, AlGaAs and GaP," J. W. Lee, J. Hong, E. S. Lambers, C. R. Abernathy and S. J. Pearton, W. S. Hobson and F. Ren, J. Electrochem. Soc. 143, 2010 (1996)

"Comparison of Masking Materials for High Microwave Power CH<sub>4</sub>/H<sub>2</sub>/Ar Etching of III-V Semiconductors," J. W. Lee, R. V. Crockett and S. J. Pearton, J. Vac. Sci. Technol. B 14, May/June (1996)

"BCl<sub>3</sub>/N<sub>2</sub> Dry Etching of InP, InAlP and InGaP," F. Ren, J. R. Lothian, J. M. Kuo, W. S. Hobson and J. Lopata, J. A. Caballero and S. J. Pearton, M. W. Cole, J. Vac. Sci. Technol. B 14, May/June (1996)

"ICl Plasma Etching of III-V Semiconductors," J. W. Lee, J. Hong, E. S. Lambers and S. J. Pearton, J. Vac. Sci. Technol. B 15, 256 (1997).

"Dry Etching of III-V Semiconductors in IBr/Ar Electron Cyclotron Resonance Plasmas," J. W. Lee, J. Hong, E. S. Lambers, C. R. Abernathy and S. J. Pearton, W. S. Hobson and F. Ren, J. Electron. Mater. 28, 356 (1996).

"Cl<sub>2</sub>/Ar Plasma Etching of Binary, Ternary and Quaternary In-Based Compound Semiconductors," J. W. Lee, J. Hong, C. R. Abernathy, E. S. Lambers and S. J. Pearton, W. S. Hobson and F. Ren, J. Vac. Sci. Technol. B 15, 657 (1997).

"Dry Etching of InGaP and AlInP IN CH<sub>4</sub>/H<sub>2</sub>/Ar," J. W. Lee, S. J. Pearton, C. J. Santana, E. S. Lambers and C. R. Abernathy, Plasma Chem. & Plasma Proc. 27, 412 (1996).

"Plasma Etching of III-V Semiconductors in BCl<sub>3</sub> Chemistries: Part I : GaAs and Related Compounds," J. W. Lee, J. Hong, E. S. Lambers, C. R. Abernathy and S. J. Pearton, W. S. Hobson and F. Ren, Submitted to Plasma Chem. & Plasma Proc. 27, 650 (1996).

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"Etching Processes for Fabrication of GaN/InGaN/AlN Microdisk Laser Structures," J. W. Lee, C. B. Vartuli, C. R. Abernathy, J. D. MacKenzie, J. R. Mileham and S. J. Pearton, R. J. Shul, J. C. Zolper and M. Hagerott-Crawford, R. G. Wilson and R. N. Schwartz, J. Vac. Sci. Technol. B 15, 6256 (1996).

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"Charge and Spin Current Flows in Spin Transistors and Similar Devices," Selman Hershfield and Greg Beck, 41st Magnetism and Magnetic Materials meeting in Atlanta.

"Dry Etch Processes for NiMnSb, LaCaMnO<sub>3</sub> and Related Materials", J. Hong, J.J. Wang, E.S. Lambers, J.A. Caballero, J.R. Childress, S.J. Pearton, K.-H Dahmen, S. Von Molnar, F.J. Cadieu and F. Sharifi, 1997 Fall MRS Meeting, Boston.

"High Rate Etching of Metals for Magnetoelectronic Applications", S.J. Pearton, K.B. Jung, J. Hong, J.W. Lee, J.A. Caballero, J.R. Childress, M. Jensen and A.T. Hurst, Jr., Electrochemical Society Meeting, Paris, France, September 1997 (invited).

"Development of ECR and ICP High Density Plasma Etching for Patterning", K.B. Jung, J.R. Childress, S.J. Pearton, M. Jensen and A. Hurst, 1997 Am. Vac. Soc. National Symp., San Jose, CA.

"ECR Plasma Etching of Oxides and SrS and ZnS-based EL Materials for Flat Panel Displays", J.W. Lee, M.R. Davidson, B. Pathangey, P.H. Holloway, A. Davydov, T.J. Anderson, S.J. Pearton and F. Ren, 1997 Am. Vac. Soc. National Symp., San Jose, CA.

"High Rate ECR Plasma Etching of Cu at 25°C in Cl<sub>2</sub>/Ar", K.B. Jung, J.W. Lee, Y.D. Park, J.R. Childress, S.J. Pearton and F. Ren, 1996 Fall MRS Meeting, Boston.

"Fabrication of Nanometer-Size Magnetic Structures Using e-beam Patterned Deposition Masks", Y.D. Park, J.A. Caballero, A. Cabbibo, J.R. Childress, H.D. Hudspeth, T.J. Schultz and F. Sharifi, 41st annual conference on Magnetism and Magnetic Materials, Atlanta, GA, November 12-15, 1996.

"Magnetic Properties of Multilayered Co-Cu Granular Composites", A. Cabbibo, Y.D. Park, J.A. Caballero and J.R. Childress, 1997 Spring Meeting of the MRS, San Francisco, CA, March 31-April 4, 1997.

"Low-temperature Growth of NiMnSb Heusler Alloy Thin Films", J.R. Childress, J.A. Caballero, W.J. Geerts, F. Petroff, P. Galtier, Y. Suzuki, J.-U. Thiele and D. Weller, 1997 Spring Meeting of the MRS, San Francisco, CA, March 31-April 4, 1997.

"Structural and Magnetotransport Properties of NiMnSb/Cu and NiMnSb/Ag Multilayers", J.A. Caballero, F. Petroff, A. Cabbibo, Y.D. Park and J.R. Childress, 1997 Spring Meeting of the MRS, San Francisco, CA, March 31-April 4, 1997.

"Transport Measurements of Magnetic Multilayers at Reduced Lateral Dimensions", Y.D. Park, H.D. Hudspeth, T.J. Schultz, A. Cabbibo, J.A. Caballero, F. Sharifi and J.R. Childress, 1997 Spring Meeting of the MRS, San Francisco, CA, March 31-April 4, 1997.

"UHV Sputter-Deposition of Ultrathin Magnetic Films and Multilayers", J.R. Childress (invited), 126th TMS annual meeting, February 9-13 1997, Orlando, FL.

"Magnetic Properties of Granular CoCu Ultrathin Films", A. Cabbibo, Y.D. Park, J.A. Caballero and J.R. Childress, 126th TMS annual meeting, February 9-13 1997, Orlando, FL.

"Magnetism and Magnetoresistance in NiMnSb Multilayers" (in French), J.R. Childress, J.A. Caballero, F. Petroff, L.F. Schelp, P. Galtier, 5th Colloque Louis Néel, June 5-7 1997, Banyuls-sur-Mer, France.

"Magnetic and Magnetotransport Properties of Granular Multilayer Composites", (invited) J.R. Childress, A. Cabbibo and W. Geerts, 4th International Conference on Composites Engineering, July 6-12 1997, Big Island, Hawaii.

"Magnetic and Magneto-optical Properties of NiMnSb Thin Films", J.A. Caballero, W.J. Geerts, F. Petroff, J.-U. Thiele, D. Weller and J.R. Childress, International Conference on Magnetism, July 27-August 1 1997, Cairns, Australia.

"Magnetic and Magnetotransport Properties of (CoCu)/Cu Multilayer Films, A. Cabbibo, Y.D. Park and J.R. Childress, International Conference on Magnetism, July 27-August 1 1997, Cairns, Australia.

"Characterization of Optical Materials Using Auger Electron Spectroscopy", Mark R. Davidson and Paul H. Holloway, invited talk, SPIE Meeting on Critical Review of Analytical Techniques for Optical Materials, San Diego, CA, July 27-29, 1997.

"Semiempirical Calculations of Spectroscopy of Ce<sup>+3</sup> in Metal Sulfide Host Crystals", T.A. O'Brien, P.D. Rack, P.H. Holloway and M.C. Zerner, Florida Chapter of the American Chemical Society, Orlando, FL, May 2-3, 1997.

"Pulsed Laser Deposition of Thin Film Phosphors for Field Emission Flat Panel Displays", S. Jones, D. Kumar, R.K. Singh and P.H. Holloway, 43<sup>rd</sup> Annual National Symp. of the AVS, Philadelphia, PA, October 14-18, 1996.

"Pulsed Laser Deposition of Y<sub>2</sub>O<sub>3</sub>: Eu CL Phosphors", S.L. Jones, D. Kumar, R.K. Singh and P.H. Holloway, Second Intl. Conf. on Display Phosphors, San Diego, CA, November 18-20, 1996.

"Pulsed Laser Deposition of Thin Film Phosphors for Field Emission Flat Panel Displays", S.L. Jones, D. Kumar, R.K. Singh and P.H. Holloway, 190th Meeting of the Electrochemical Society, San Antonio, TX, October 6-11, 1996.

"Deposition and Characterization of Eu:Y<sub>2</sub>O<sub>3</sub> Red Phosphor Thin Films", D. Kumar, R.K. Singh, S. Jones and P.H. Holloway, 1997 Spring Meeting of the MRS, San Francisco, CA, March 31-April 4, 1997.

"Semiempirical Calculations of 4f-5d Spectroscopy of Ce<sup>3+</sup> in Metal Sulfide Host Crystals" Ted O'Brien, Philip Rack, Paul Holloway and Mike Zerner, 1997 Sanibel Conference, Palm City, FL, May, 1997.

"Ferromagnetic Properties of Spark-Processed Photoluminescing Silicon" J. Hack, M.H. Ludwig, and R.E. Hummel, Materials Research Society 1996 Fall Meeting, December 2-6 1996, Boston.

"Multicolor-Effects of Luminescing, Nanostructured Silicon After Spark-Processing in Pure and Composite Gases", M.H. Ludwig, A. Augustin, and R.E. Hummel, Materials Research Society 1996 Fall Meeting, December 2-6 1996, Boston.

"Calculation of Giant Magnetoresistance in Laterally Confined Multilayers", Kingshuk Majumdar, Jian Chen, and Selman Hershfield, March 1997 Meeting of the American Physical Society.

"Flux Pinning in Nb by an Array of Magnetic Dots", Maria Velez, Jose I. Martin, Josep Nogues and Ivan K. Schuller, March Meeting, The American Physical Society, Bull. Am. Phys. Soc. 42 63 (1997).

"Fabrication of Submicrometer Magnetic Structures by e-Beam Lithography", Yvan Jaccard, Jose I. Martin, Josep Nogues, J.-M. George and Ivan K. Schuller, March Meeting, The American Physical Society, Bull. Am. Phys. Soc. 42, 506 (1997).

"Pinning Effects by Arrays of Magnetic Dots on Niobium Film", J.I. Martin, M. Velez, J. Nogues, A. Hoffmann, Y. Jaccard and Ivan K. Schuller, International Conference on Magnetism (ICM) 1997, Cairns, Australia, July 27-August 1, 1997.

"Domain Structure and Magnetoresistance in Chains of Submicron Co Dots", M.J. Van Bael, K. Temst, C. Van Haesendonck, V.V. Moshchalkov, Y. Bruynseraede, J.I. Martin, J. Nogues and Ivan K. Schuller, 16<sup>th</sup> General Conference, EPS, Condensed Matter Division, Leuven, Belgium, August 25-28, 1997.

"MFM Study of the Magnetic Domain Structure in Chains of Submicrometer Sized Co Dots", M.J. Van Bail, K. Temst, C. Van Haesendonck, V.V. Moshchalkov, Y. Bruynseraede, J.I. Martin, J. Nogues and Ivan K. Schuller, Annual Meeting, Belgian Physical Society, 1997.

"Pinning of the Vortex Lattice in Nb Film by a Regular Magnetic Dot Array", Y. Jaccard, A. Hoffmann, M.-C. Cyrille, J. Nogues, I.K. Schuller, J.I. Martin, M. Velez, J.L. Vicent, 16<sup>th</sup> General Conference, EPS, Condensed Matter Division, Leuven, Belgium, August 25-28, 1997.

"Mesoscopic and Strongly Correlated Electron System", Aviad Frydman, Landau Institute for theoretical Physics, Moscow (Kosygina), Russia, June 14-26, 1997.

"Polarized Neutron Reflectometry Study of Ferromagnetic Proximity Effect in Magnetic Bilayers", A.L. Shapiro, B.M. Maranville, M. Fitzsimmons and F. Hellman, Poster presentation at the Los Alamos Neutron Science Center User Group Meeting.

"Relative Merits of  $\text{Cl}_2$  and  $\text{CO}/\text{NH}_3$  Plasma Chemistries for Dry Etching of MRAM Device Elements," K.B. Jung, h. Cho, Y.B. Hahn, E.S. Lambers, Y.D. Park, S.J. Pearton, S. Nozuchi, D. Johnson, A.T. Hurst and J.R. Childress, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Fabrication of Exchange-Biased Spin-Valves with CoFeB Amorphous Layers," T. Feng and J.R. Childress, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Calculations of CPP-GMR with a Current-Conserving Method," J. Chen, T. Choy and S. Hershfield, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Correlation Between Spin-Polarization and Magnetic Movement per Atom in Ferromagnetic Fe-Ni Alloys," T. Choy, J. Chen and S.S. Hershfield, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Effect of Ion Irradiation Induced Disorder on the Magnetoresistance of Lanthanum Manganites," P. Xiong, S.M. Watts, M. Li, S. Wirth, K. Kahmen, S. von Molnár, A.S. Katz and R.C. Dynes, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Magnetism of Nanometer-Scale Iron Particles Arrays," S. Wirth, S. von Molnár and D.D. Awschalom, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998 (invited).

" $\frac{1}{f}$  noise in Magnetic Films," B. Racquet, J.M.D. Coey, D.M. Lind and S. von Molnár, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Simulation of the Interband s-d and Intraband s-s Electron-Phonon Contributions to the Electrical sensitivity of Fe/Cr Multilayers," B. Alneida, V.A. Amaral, J.B. Sousa, J. Colino, I.K. Schuller and Y. Bouynserade, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Perpendicular magnetoresistance of Microstructured Ge-Cr Multilayers," N.-C. Cyrille, S. Kim and I.K. Schuller, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Spin Waves in Exchange Bias Systems Studied by Light Scattering," G. Guentherodt, P. Miltinyi, J. Noguis, I.K. Schuller, C. Malbreau, M. Bauer, F. Fassbenden, B. Hillebrands, R. Jungblut, J. Koblhepp and A. Reinders, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Positive Exchange Bias in  $\text{MnF}_2/\text{Fe}$  Bilayers," C. Leighton, I.K. Schuller and J. Nogues, 43<sup>rd</sup> Ann. Conf. Magn. & Mag. Materials, Miami 1998.

"Dry Etch Processes for  $\text{NiMnSb}$ ,  $\text{LaCaMnO}_x$  and Related Materials," J. Hong, J.J. Wang, E.S. Lambers, J.A. Caballero, J.R. Childress, S.J. Pearton, K. Dahmen, S. von Molnár, F.J. Cadieu and F. Sharifi, 1997 Fall MRS Meeting, Boston, 1997.

"Patterning of Thin Film NiMnSb Using ICP Etching," J. Hong, J. Caballero, E.S. Lambers, J.R. Childress and S.J. Pearton, 40<sup>th</sup> Electron. Ion and Photon Beam Conf., Chicago, 1998.

"ICP Etching of NiFe and NiFeCo in GMR Structures," K.B. Jung, J.R. Childress, S.J. Pearton, M. Jenson and A. Hurst, 1998 Spring MRS, San Francisco, April 1998.

"Plasma Chemistries for Etching of LaCaMnO<sub>3</sub>/SmCo GMR Structures," J.J. Wang, K.B. Jung, J.R. Childress, S.J. Pearton, F. Sharifi, K. Dahmen, E.S. Gillman, F. Cadieu, R. Rami and L. Chen, 1998 Spring MRS, San Francisco, 1998.

"Plasma Etching for Novel Electronic and magnetic Thin Films," S.J. Pearton, J. Lee, K.B. Jung, H. Cho, E.S. Lambers and J.R. Childress, 1998 Florida AVS Symp., Orlando, 1998 (invited).

"A New Probe to Perform magneto-Optical Kerr Measurements on Thin Films and Multilayers," W. Geerts, J. Childress, S.J. Pearton, T. Schmeidel and V. Williams, 1998 APS March Meeting, Los Angeles, 1998.

"High Density Plasma Etching of NiFe, NiFeCo and NiMnSb-based Multilayers for magnetic Storage Elements," K.B. Jung, J. Hong, H. Caballero, J.R. Childress, S.J. Pearton, M. Jenson and A. Hurst, 1998 Spring E-MRS Meeting, Strasbourg, France, 1998.

"ECR-CVD SiN<sub>x</sub> for T-gate Passivation," F. Ren, J. LaRoche, T. Anderson, S.J. Pearton, J.W. Lee, D. Johnson, R.J. Shul and C.S. Wu, 193<sup>rd</sup> ECS Meeting, San Diego, 1998.

"Plasma Etching of NiFe/Cu and NiMnSb/Al<sub>2</sub>O<sub>3</sub> Multilayers for Sub-Micron Pattern Deposition," K.B. Jung, J. Hong, J. Caballero, J.R. Childress, S.J. Pearton, F. Sharifi, M. Jenson and A. Hurst, 3<sup>rd</sup> Intl. Symp. Metallic Multilayers '98, Vancouver, 1998.

"*In-situ* Monitoring of Etch By-Products During RIBE Using Cl<sub>2</sub>/Ar," J. Lee, S.J. Pearton, C. Abernathy, G. Vawter, R. Shul, M. Bridges and C. Willison, 1997 Fall MRS Meeting, Boston, 1997.

"ECR Plasma Etching of Oxides and SrS and ZnS EZ Materials for Flat Panel Displays," J. Lee, M. Davidson, B. Pathangey, P. Holloway, T. Anderson, S. Pearton and F. Ren, 44<sup>th</sup> Nat. Symp. AVS, San Jose, 1997.

"Plasma Etching of NiFeCo, NiMnSb and CoFeB-Based Multilayers," K. Jung, H. Cho, T. Feng, J. Caballero, D. Park, J. Childress, F. Ren and S.J. Pearton, ECS Meeting, Boston, 1998.

"Magnetic Order of Co<sub>0.1</sub>Pt<sub>0.9</sub> in Proximity of CoPt<sub>3</sub>," A. L. Shapiro, F. Hellman, and M. R. Fitzsimmons, oral presentation at MRS Conference Spring 1998.

"Flux Pinning in a Superconductor by an Array of Submicron Magnetic Dots", I.K. Schuller, Bull. Am. Phys. Soc. 43, 635 (1998). (Invited Talk)

"Periodic Pinning in Nb by Magnetic Dots", Arrays Axel Hoffmann, M.C. Jaccard, Ivan K Schuller, Jose I. Martin, Maria Velez and Jose Vicent, Bull. Am. Phys. Soc. 43, 325 (1998).

"The Search for Depth Dependence in Proximity Effect-Induced Ferromagnetic Moments", B. B. Maranville, A. L. Shapiro, F. Hellman, and M. R. Fitzsimmons, Poster presentation at the Los Alamos Neutron Science Center User Group Meeting August 1998.

"Conductance Fluctuations in Mesoscopic Granular Superconductors", Aviad Frydman, oral presentation at the APS March meeting, Los Angeles CA (1998).

"Disorder Induced Andreev Reflections in Granular Metals", Aviad Frydman, oral presentation at the APS March meeting, Los Angeles CA (1998).

"Magnetoresistance of Granular Ferromagnets - Observation of a Magnetic Proximity Effect?," Aviad Frydman, poster presentation at the Topical workshop on Magnetic Heterostructures, Madison, WI (1998).

"Nanostructure effects on the optical properties of luminescent materials", P.H. Holloway and S.L. Jones, 3<sup>rd</sup> International Meeting on Physical Fields, Tsukuba, Japan, February 18-20, 1998. (Invited)

"Advances in Field Emission Display Phosphors", Paul Holloway, S. Jones, T. Trottier, B. Abrams, J. Thomes, and H. Swart International Vacuum Microelectronics Conference, Asheville, NC, July 19-24, 1998. (Invited)

"Enhanced Efficiency and Lifetime of Thin Film and Screened FED Phosphors", Paul H. Holloway, S.L. Jones, T.A. Trottier, B. Abrams, J.-S. Bang, X.-M. Zhang and C. Kondoleon, International Research in Displays Conference, Seoul, Korea, September 28-October 1, 1998. (Invited)

"Crystal Field and Semiempirical Molecular Orbital Calculations of Ce<sup>+3</sup> Doped Alkaline Earth Sulfide Phosphors", P.D. Rack, T.A. O'Brien, M.C. Zerner and P.H. Holloway, Third Intl. Conf. on Display Phosphors, Huntington Beach, CA, November 3-5, 1997

"Advances in Thin Film Cathodoluminescent Phosphors", P.H. Holloway, S. Jones, T. Trottier, B. Abrams, W.J. Thomes, R. Singh, and D. Kumar, 1998 Spring Meeting of the MRS, San Francisco, CA, April 13-17, 1998

"Improved Luminescent Properties of Pulsed Laser Deposited Eu:Y<sub>2</sub>O<sub>3</sub> Thin Film Phosphors on a Sapphire Substrates", K.G. Cho, D. Kumar, D.G. Lee, S.L. Jones, P.H. Holloway and R.K. Singh, 1998 Spring Meeting of the MRS, San Francisco, CA, April 13-17, 1998

"Luminescent Properties of Pulsed Laser Deposited Eu:Y<sub>2</sub>O<sub>3</sub> Thin Film Phosphors on Diamond Coated Silicon Substrates", K.G. Cho, D. Kumar, D.G. Lee, S.L. Jones, P.H. Holloway and R.K. Singh, 1998 Spring Meeting of the MRS, San Francisco, CA, April 13-17, 1998

"Eu Doped Y<sub>2</sub>O<sub>3</sub> Thin Films for Increased Luminescence", S.L. Jones, J. Thomes, K. Gong, D. Kumar, R.K. Singh, and P.H. Holloway, 26<sup>th</sup> Annual Symposium of the Florida Chapter of the AVS, Orlando, FL, Feb. 23-24, 1998

"Tight-binding Calculation of the GMR for Co/Cu Superlattices," Jian Chen and Selman Hershfield, March 1998 Meeting of the American Physical Society.

"Magnetoresistance of the Double-Tunnel-Junction Coulomb Blockade with Magnetic Metals," Kingsuk Majumdar and Selman Hershfield, March 1998 Meeting of the American Physical Society.

"Separation of Spin and Charge Currents in a Superconductor," Selman Hershfield, Invited Talk March 1998 Meeting of the American Physical Society.

"Calculations of the CPP-GMR with a Current Conserving Method," Jian Chen, Tat-Sang Choy, and Selman Hershfield, to be presented at the 43rd Annual Conference on Magnetism and Magnetic Materials, Miami, Florida, November 9-12, 1998.

"Correlation Between Spin Polarization and Magnetic Moment Per Atom in Ferromagnetic Fe-Ni alloys," Tat-Sang Choy, Jian Chen, and Selman Hershfield, to be presented at the 43rd Annual Conference on Magnetism and Magnetic Materials, Miami, Florida, November 9-12, 1998.

F. Sharifi, invited presentation at the 1998 APS March Meeting, Los Angeles, CA.

"Plasma Etching of NiFeCo, NiMnSb and CoFeB-based Multilayers," K.B. Jung, H. Cho, T. Feng, J. Caballero, D. Park, J. Childress, F. Ren and S.J. Pearton, 5<sup>th</sup> Intl. Symp. Magnetic Materials, Processes and Devices, ECS Meeting, Boston, Nov. 1998.

"Wet and Dry Etch Selectivity for the GaAs/AlGaAs and GaAs/InGaP Systems," D. Hays, C. Abernathy, S.J. Pearton, F. Ren and W.S. Hobson, State-of-Art program on Comp. Semi., ECS Meeting, Boston, Nov. 1998.

"Long-term Corrosion Stability of Patterned NiFe/Cu/NiFeCo Multilayers after Cl<sub>2</sub>-based Plasma Etching," K.B. Jung, F. Sharifi, J. Marburger and S.J. Pearton, APS Centennial Meeting, Atlanta, March 1999.

"Transport Studies of I-D Magnetic Wires," J. Marburger, H. Hudspeth, F. Sharifi and S.J. Pearton, APS Centennial Meeting, Atlanta, March 1999.

"Development of Low Temperature  $\text{SiN}_x$  and  $\text{SiO}_2$  by ICP-CVD," J. Lee, K.D. Mackenzie, D. Johnson, S.J. Pearton, F. Ren and J.N. Sasserath, MRS Spring Meeting, San Francisco, April 1999.

"Selective Dry Etching of the  $\text{GaN/InN/AlN}$ ,  $\text{GaAs/AlGaAs}$  and  $\text{GaAs/InGaP}$ ," D. Hays, C. Abernathy, W. Hobson, S. Pearton, J. Han, R.J. Shul, H. Cho, K. Kung, F. Ren and Y. Hahn, MRS Spring Meeting, San Francisco, April 1999.

"Dry Etching to Form Submicron Features in CMR Oxides :  $\text{PrCaBaMnO}_x$  and  $\text{LaSrMnO}_x$ ," K.P. Lee, K. Jung, H. Cho, D. Kumar, S. Pietambaram, R.K. Singh, P. Hogan, K. Dahmen and S.J. Pearton, MRS Spring Meeting, San Francisco, April 1999.

"Effect of Noble Gas Addition (He, Ar, Ke) on  $\text{Cl}_2$ -based Etching of  $\text{NiFe}$  and  $\text{NiFeCo}$ ," K.B. Jung, H. Cho, Y.D. Park, S.J. Pearton, J. Childress and M. Jenson, 45<sup>th</sup> Int. Symp. AVS, Baltimore, Nov. 1998.

"Comparison of  $\text{Cl}_2$  and  $\text{F}_2$ -based Chemistries for the ICP Etching of  $\text{NiMnSb}$ ," J. Hong, J. Caballero, J. Childress and S.J. Pearton, 45<sup>th</sup> Int. Symp. AVS, Baltimore, Nov. 1998.

"Development of Chemically Assisted Dry Etching Methods for Magnetic Device Structures," K.B. Jung, H. Cho, J. Marburger, F. Sharifi, R.K. Singh, D. Kumar, K.H. Dahmen and S.J. Pearton, 43<sup>rd</sup> Electron, Ion and Photon Beam for Nanofabrication Conf., Marco Island, FL, June 1999.

"*In-situ* Plasma Cleaning Processes for Prevention of Corrosion on Dry Etched Magnetic Multilayers," K. Jung, S.J. Pearton, J. Marburger and F. Sharifi, MRS Spring Meeting, San Francisco, April 1999.

" $\text{Cl}_2$ -based Dry Etching of Doped Manganate Perovskites:  $\text{PrBaCaMnO}_x$  and  $\text{LaSrMnO}_x$ ," K.P. Lee, K. Jung, H. Cho, D. Kumar, S. Pietambaram, R.K. Singh, K.H. Dahmen and S.J. Pearton, Florida Chapter of AVS, Orlando, March 1999.

"Electron Tunnelling Measurements on  $\text{LaCaMnO}_3$ ," H.D. Hudspeth, F. Sharifi, S. Pietambaram, D. Kumar, R.K. Singh, S.J. Pearton, E. Gillman, K.H. Dahmen and S. Von Molnar, 1998 Fall MRS Meeting, Boston, Dec. 1998.

"Comparison of Characteristics of Dry Etching of  $\text{LaCaMnO}_3$ ,  $\text{NiMnSb}$  and  $\text{NiFe}$  Thin Films," K. Jung, H. Cho, J. Wang, J. Caballero, S.J. Pearton, J. Childress and K.H. Dahmen, 1998 Fall MRS Meeting, Boston, Dec. 1998.

"Transport Studies of ID Magnetic Wires," J. Marburger, H.D. Hudspeth, F. Sharifi, M. Overberg, C.R. Abernathy and S.J. Pearton, 1998 Fall MRS Meeting, Boston, Dec. 1998.

"Development of Low Temperature  $\text{SiN}_x$  and  $\text{SiO}_2$  films by ICP-CVD," J. Lee, D. Johnson, S.J. Pearton and F. Ren, MRS Spring Meeting, San Francisco, April 1999.

"Dry Etching Characteristics of LaCaMnO<sub>3</sub>, NiMnSb and NiFe," K.B. Jung, H. Cho, T. Feng, J.R. Childress and S.J. Pearton, 27<sup>th</sup> Appl. Vac. Sci. Tech. Symp., Orlando, March 1999.

"Selective Dry Etching Using ICP : GaAs/AlGaAs and GaAs/InGaP," D. Hays, H. Cho, K. Jung, C. Abernathy, S.J. Pearton and F. Ren, 27<sup>th</sup> Appl. Vac. Sci. Tech. Symp., Orlando, March 1999.

"Novel *in-situ*, Ion Bombardment Process for a Thermally Stable (>800°C) Plasma Deposited Dielectric," F. Ren, S.J. Pearton, J. LaRoche and J.W. Lee, MRS Spring Meeting, San Francisco, April 1999.

"Simulation of the Interband s-d and Intraband s-s Electron-phonon Contributions to the Electrical Resistivity of Fe/Cr Multilayers," D. Almeida, V. Amaral, J.B. Sousa, I.K. Schuller and Y. Broynseraede, 43<sup>rd</sup> Ann. Conf. Magn. Magn. Mat., Miami, Nov. 1998.

"Perpendicular Magnetoresistance of Microstructured Fe-Cr Multilayers," M. Cyrille, S. Kim and I.K. Schuller, 43<sup>rd</sup> Ann. Conf. Magn. Magn. Mat., Miami, Nov. 1998.

"Spin Waves in Exchange Bias Systems Studied by Light Scattering" G. Guentherodt, J. Nogues, I.K. Schuller, C. Mathiue and A. Reinders, 43<sup>rd</sup> Ann. Conf. Magn. Magn. Mat., Miami, Nov. 1998.

"Positive Exchange Bias in MnF<sub>2</sub>/Fe Bilayers," C. Leighton, I.K. Schuller and J. Nogues, 43<sup>rd</sup> Ann. Conf. Magn. Magn. Mat., Miami, Nov. 1998.

"Effect of Ion Irradiation Induced Disorder on the MR of Lanthanum Manganites," P. Xiong, S. Watts, S. Wirth, K.H. Dahmen, S. Von Molnar, A. Katz and R.C. Dynes, 43<sup>rd</sup> Ann. Conf. Magn. Magn. Mat., Miami, Nov. 1998.

"Magnetism of Nonometer-Scale Iron Particle Arrays," S. Wirth, S. Von Molnar and D. Amschulom, 43<sup>rd</sup> Ann. Conf. Magn. Magn. Mat., Miami, Nov. 1998.

" $\frac{l}{f}$  Noise in magnetic Films," B. Raquest, J. Coey, D. Lind and S. Von Molnar, 43<sup>rd</sup> Ann. Conf. Magn. Magn. Mat., Miami, Nov. 1998.

"Calculations of CPP-GMR with a Current-Conserving Method," J. Chen, T.S. Choy and S. Hershfield, 43<sup>rd</sup> Ann. Conf. Magn. Magn. Mat., Miami, Nov. 1998.

"Correlation Between Spin Polarization and Magnetic Movement per Atom in Ferromagnetic Fe-Ni Alloys," T.S. Choy, J. Chen and S. Hershfield, 43<sup>rd</sup> Ann. Conf. Magn. Magn. Mat., Miami, Nov. 1998.

"Electron Tunnelling Measurements of the CMR Perovskites," H.D. Hudspeth, F. Sharifi, P. Xiong and S. Von Molnar, APS March Meeting, Atlanta, March 1999.

"Magnetoresistance in Rare-earth Chalcogenides-Relationship to Other Rare-earth Compounds," S. Von Molnar, APS March Meeting, Atlanta, March 1999.

" $\frac{I}{f}$  Noise in Colossal MR Materials," A. Anone, B. Racquet, P. Xiong, Z. Fisk and S. Von Molnar, APS March Meeting, Atlanta, March 1999.

"Ballistic Electron Focussing By Elliptic Reflecting Carriers," J. Heremans, S. Von Molnar, D. Awschalom and A. Gossard, APS March meeting, Atlanta, March 1999.

"Novel Magnetotransport in Half-Metallic  $\text{CrO}_2$ ," S. Watts, S. Wirth, A. Anone, S. Von Molnar, A. Barry and J. Coey, APS March Meeting, Atlanta, March 1999.

"Gas Adsorption Studies on Superlattices of Co/Ni," A. Cabresa, S. Kim and I.K. Schuller, APS March Meeting, Atlanta, March 1999.

"Rough Interfaces Mimic Tunnelling," D. Rabson, A. Romero and I.K. Schuller, APS March Meeting, Atlanta, March 1999.

"A Complete Microstructural Analysis of Fe/Cr Superlattices," M. Gomez, S. Kim, M. Cyrille, I.K. Schuller and K. Krishnan, APS March Meeting, Atlanta, March 1999.

"Effect of Cooling Field and Interface Roughness on Exchange Bias in  $\text{MnF}_2/\text{Fe}$ ," C. Leighton, I.K. Schuller and J. Nogues, APS March Meeting, Atlanta, March 1999.

"The Dependence of Anisotropic Magnetoresistance on Structural Parameters in Fe/Cr Superlattices," M. Cyrille, S. Kim, M. Gomez, C. Leighton and I.K. Schuller, APS March Meeting, Atlanta, March 1999.

"Structural, Magnetic and Transport Properties of  $\text{Fe}_3\text{O}_4/\text{MgO}/\text{Fe}$  Trilayers," S. Kim, C. Leighton and I.K. Schuller, APS March Meeting, Atlanta, March 1999.

"Pinning Effects of Anisotropic Arrays of Ni Dots in Nb Films," J. Vincent, J. Martin, G. Hoffman and I.K. Schuller, APS March Meeting, Atlanta, March 1999.

"Photoexcitation of Superconductivity," I.K. Schuller, APS March Meeting, Atlanta, March 1999.

"Magnetoresistance in Films with Tortuous Current Paths," S. Hershfield, S. Arrenson and A. Hebard, APS March Meeting Atlanta, March 1999.

"Temperature Dependence of the GMR without Spin-flip Scattering," J. Chen, T.S. Choy and S. Hershfield, APS March Meeting, Atlanta, March 1999.

"Kondo Physics in a Normal Superconductor Point Contact," A. Clerk, V. Ambegaokar and S. Hershfield, APS March Meeting, Atlanta, March 1999.

"Correlation Between Spin Polarization and Magnetic Current in Ferromagnetic Alloys," T.S. Choy, J. Chen and S. Hershfield, APS March Meeting, Atlanta, March 1999.

"Nanotubes for Electrostatic Force Microscopy," S. Arrenson, Q. Hudspeth, O. Ganesh and A.F. Hebard, APS March Meeting, Atlanta, March 1999.

"The Role of Interface Traps in the Scaling Collapse of Complex Impedance Data of Al/Al<sub>2</sub>O<sub>3</sub> Tunnel Junctions," K. McCarthy, S. Arrenson and A.F. Hebard, APS March Meeting, Atlanta, March 1999.

"Local MR Response of Nanoscale Co Dots on Si using AFM," J. Wittsock, K. Rao, J. Nogues and I.K. Schuller, MRS Spring Meeting, San Francisco, CA, April 1999.

"Flux Pinning in a Superconductor by an Array of Submicron Magnetic Dots," Ivan K. Schuller, XIV Simposio Latinamericano, Oaxaca, Mexico, January 11-18, 1998.

"Nanoindentation And Capacitive Force Modulation," S.A. Syed Asif, K.J. Wahl, and R.J. Colton, American Vacuum Society 45<sup>th</sup> International Meeting, Baltimore (1998).

"Nanoscale Surface Mechanical Property Measurements Using Force Modulation Technique," S.A. Syed Asif, K.J. Wahl, and R.J. Colton, 217<sup>th</sup> American Chemical Society National Meeting, Anaheim, March 21-25 (1999).

"Measuring and imaging contact stiffness quantitatively at nanoscale using force modulation," S.A. Syed Asif, K.J. Wahl, and R.J. Colton, 46<sup>th</sup> American Vacuum Society International Meeting, to be held in October 25-29, Seattle (1999).

"Magnetic Order Of Co<sub>0.1</sub>Pt<sub>0.9</sub> In Proximity Of CoPt<sub>3</sub>," A. L. Shapiro, oral presentation at MRS Conference, Spring 1998.

"The Search For Depth Dependence In Proximity Effect-Induced Ferromagnetic Moments," B. B. Maranville, A. L. Shapiro, F. Hellman, and M. R. Fitzsimmons, Poster presentation at the Los Alamos Neutron Science Center User Group Meeting August 1998.

"Magnetic Properties of Nanometer-scale Iron Particles," S. Wirth, J. J. Heremans, S. von Molnár, M. Field and D. D. Awschalom, APS March Meeting 1998, Los Angeles, USA.

"Electrical Noise from Phase Separation in PrCaMnO<sub>3</sub> Single Crystal," A. Prange, S. von Molnar, L. Pinsaid-Godast and A. Revcolevschi, 44<sup>th</sup> Ann. Conf. Magnetism and Magnetic Materials, San Jose, November 1999.

"Magnetic Interactions in nm-Scale Particle Arrays Grown onto Permalloy Films," S. Wirth and S. con Molnar, 44<sup>th</sup> Ann. Conf. Magnetism and Magnetic Materials, San Jose, November 1999.

"Investigating Artificial Barriers in Spin-Dependent Tunnel Junctions with Superconducting Electrodes," C. Platt, A. Berkowitz, A.S. Katz and R.C. Dynes, 44<sup>th</sup> Ann. Conf. Magnetism and Magnetic Materials, San Jose, November 1999.

"Anisotropic Magnetotransport and Microstructural Analysis of Fe/Cr Superlattices," M. Cyrille, M.E. Gomez, C. Leighton and I.K. Schuller, 44<sup>th</sup> Ann. Conf. Magnetism and Magnetic Materials, San Jose, November 1999.

"Effect of the Antiferromagnetic Spin-Hop in Exchange Bias," J. Nogues, C. Morellon, M. Ibarra, C. Leighton and I.K. Schuller, 44<sup>th</sup> Ann. Conf. Magnetism and Magnetic Materials, San Jose, November 1999.

"Exponential Thickness Dependence and Nonlinear I-V Curves: Do they Establish Tunneling," B. Fousson, R. Escadero, C. Leighton, A. Romero, S. Kim, I.K. Schuller, M. Grossman and D. Rabson, 44<sup>th</sup> Ann. Conf. Magnetism and Magnetic Materials, San Jose, November 1999.

"45° Exchange Coupling Across the Fe-Fe<sub>2</sub> Interface," M. Fitzsimmons, D. Yashar, C. Leighton, I.K. Schuller, J. Nogas and J. Dura, 44<sup>th</sup> Ann. Conf. Magnetism and Magnetic Materials, San Jose, November 1999.

"Coercivity in the Positive Exchange Bias Regime," C. Leighton, I.K. Schuller and J. Nogues, 44<sup>th</sup> Ann. Conf. Magnetism and Magnetic Materials, San Jose, November 1999.

"Spin Polarized Photoemission Study of Magnetic Films – Evidence for Half-Metallic Ferromagnetic Behavior," S. Morton, G. Waddill, J. Tobin, S. Kim and I.K. Schuller, Spring MRS, San Francisco, April 2000.

"Transient and Steady State Electrochemical Effects and its Correlation to CMP Removal Rates During Metal Removal," R.K. Singh, U. Mahajan, S.-M. Lee, Z. Chen and D. Lamholdt, Spring MRS, San Francisco, April 2000.

"Fundamental Studies on the Mechanisms of Oxide CMP," U. Mahajan, S. Lee and R.K. Singh, Spring MRS, San Francisco, April 2000.

"Particulate Effect in Cu CMP," S. Lee, U. Mahajan, A. Nagory and R. Sing, Spring MRS, San Francisco, April 2000.

"*In-Situ* Friction-Force Measurements in CMP," V. Mahajan, S. Lee and R. Singh, Spring MRS, San Francisco, April 2000.

"Fundamental Studies on Iodate Slurry Chemistries During CMP of Cu," S. Lee, U. Mahajan, V. Crasium and R.K. Singh, Spring MRS, San Francisco, April 2000.

"Epitaxial ZnO Films Grown by UV-Assisted PLD," V. Crasium, N. Bassim, R.K. Singh, J. Perriere and D. Crasium, Spring MRS, San Francisco, April 2000.

"Role of O Content and Crystallinity in Magnetoresistance Behavior of CLMO Thin Films," S. Pietambaram, D. Kumar, R.K. Singh and C.B. Lees, Spring MRS, San Francisco, April 2000.

"Low Temperature Growth of BaSrTiO<sub>3</sub> Thin Films by UV-Assisted PLD," V. Crasium, J. Howard, N. Bassim, R.K. Singh and J. Pierre, Spring MRS, San Francisco, April 2000.

"UV-Assisted PLD of Thin Films," V. Crasium and R.K. Singh, Spring MRS, San Francisco, April 2000.

"Magnetic and Magnetoresistance Properties of PLD LaCaMnO<sub>3</sub> on Si," D. Kumar, J. Narayan, R.K. Singh, C.B. Lee and J. Sankar, Spring MRS, San Francisco, April 2000.

"Modelling of Interfacial Scattering Effects During Light Emission from Phosphor Thin Films for Field Emission Displays," R.K. Singh, K. Cho, Z. Chen and D. Kumar, Spring MRS, San Francisco, April 2000.

"Nanofunctionalized Sulfide-Band Powders for Flat Panel Display Applications," M. Ollinger, V. Crasium and R.K. Singh, Spring MRS, San Francisco, April 2000.

"The Effect of Microstructure on the Brightness of PLD Y<sub>2</sub>O<sub>3</sub>:Eu Thin Film Phosphors," K. Cho, D. Kumar, R. Singh, G. Russel and B.K. Wagner, Spring MRS, San Francisco, April 2000.

"Stoichiometry Effects of Li on the Electrochemical Properties of LiMn<sub>2</sub>O<sub>4</sub> Films Grown by Laser Ablation," D. Singh, H. Hofmann, V. Crasium, R.K. Singh and J. Pierre, Spring MRS, San Francisco, April 2000.

"Room Temperature Growth of ITO Films by UV-Assisted PLD," V. Crasium, R.K. Singh and D. Crasium, Spring MRS, San Francisco, April 2000.

"Effects of Co-Dopants on the EL Properties of ZnS:Tb," P. Holloway, J. Kim, M. Davidson and B. Speck, Spring MRS, San Francisco, April 2000.

"Electron Tunnelling Measurements on the CMR Perovskites," H. Hudspeth, P. Xiong, S. von Molnar and F. Sharifi, 2000 March Meeting of APS, Minneapolis, March 2000.

"Discovery of a New Undoped nFi System – U<sub>2</sub>Co<sub>2</sub>Sn," G. Stewart, J. Kim, S. Getty and F. Sharifi, 2000 March Meeting of APS, Minneapolis, March 2000.

"Transport Measurements of Electron and Hole-doped  $\text{CaB}_6$ ," S. Getty, F. Sharifi, D. Young and Z. Fisk, 2000 March Meeting of APS, Minneapolis, March 2000.

"Dependence of the CTP-GMR on Spin-Independent Scattering in Fe/Co Superlattices," T. Choy, S. Hershfield and J. Chen, 2000 March Meeting of APS, Minneapolis, March 2000.

"A Database of Fermi Surfaces in Virtual Reality Modelling Language," T. Choy, J. Naset, S. Hershfield, C. Stanton and J. Che, 2000 March Meeting of APS, Minneapolis, March 2000.

"Magnetic Bound States of  $\text{SrCu}_2(\text{BO}_3)_2$ ," V. Kobor and S. Hershfield, 2000 March Meeting of APS, Minneapolis, March 2000.

"Zero-bias Anomalies in Magnetic Hexabodies," S. Hershfield and V. Kobor, 2000 March Meeting of APS, Minneapolis, March 2000.

"Systematic in the Behavior of  $\text{Co}_{60}$  Monolayers Deposited Linearly onto Thin Films and Doped by Electron Transfer," Q. Hudspeth, S. Arason and A.F. Hebard, 2000 March Meeting of APS, Minneapolis, March 2000.

"Experimental Determination of Screening Length in Thin Magnetic Films," K. McCarthy, N. Theodoropoulou and D. Temple, 2000 March Meeting of APS, Minneapolis, March 2000.

"The Influence of Percolation on Quantum Coherence in Coalescing Ag Films," S. Arason and A.F. Hebard, 2000 March Meeting of APS, Minneapolis, March 2000.

"Spin-Peierls Transition in  $\text{NaV}_2\text{O}_5$  in High Magnetic Fields," A.F. Hebard, S. Bompadre, V. Kotov, D. Hall, V. Bass and T. Palstra, 2000 March Meeting of APS, Minneapolis, March 2000.

"Direct Measurement of the g-Factor in Crystalline Bi at High B/T," S. Bompadre, C. Biagini, D. Maslov and A.F. Hebard, 2000 March Meeting of APS, Minneapolis, March 2000.

"Microcalorimetry: Wide Temperature Range, High Field and Small Sample Measurements," F. Hellman, 2000 March Meeting of APS, Minneapolis, March 2000. (Invited)

"Critical Phenomena of  $\text{LaSrMnO}_3$ ," D. Kim, F. Hellman and J. Coey, 2000 March Meeting of APS, Minneapolis, March 2000.

"Ion Beam Assisted MBE Growth of Magnetic  $\text{CoPt}_3$ ," D. Vasumalli, B. Marauville and F. Hellman, 2000 March Meeting of APS, Minneapolis, March 2000.

"Perpendicular Magnetic Anisotropy of  $\text{CoPt}_3$  on Vicinal Substrates," B. Maranville, A. Shapiro, F. Hellman and E.T. Yu, 2000 March Meeting of APS, Minneapolis, March 2000.

"Magnetic Field Driven Change of the Density of States of  $a\text{-Gd}_x\text{Si}_{1-x}$  at the Metal-Insulation Transition," W. Teitzer, F. Hellman and R.C. Dynes, 2000 March Meeting of APS, Minneapolis, March 2000.

"Magnetic and Thermodynamic Features of Antiferromagnetic Nanoparticles in a Metallic Matrix," R. Sappey, E. Price, F. Hellman and A. Berkowitz, 2000 March Meeting of APS, Minneapolis, March 2000.

"Local Movements and Localized Conduction Electrons in  $a\text{-Gd}_x\text{Si}_{1-x}$ ," B. Zink, D. Queen, R. Sappey, E. Janod and F. Hellman, 2000 March Meeting of APS, Minneapolis, March 2000.

"Infrared Spectroscopy of  $\text{NdCeCuO}_x$ ," E. Singley, A. Katz, S. Woods, R.C. Dynes and K. Yamada, 2000 March Meeting of APS, Minneapolis, March 2000.

"Epitaxial Growth of  $\text{CrO}_2$  Films by CVD from  $\text{Cr}_8\text{O}_{21}$  Precursors," P. Ivanov, S. Watts, D. Lind and S. von Molnar, 2000 March Meeting of APS, Minneapolis, March 2000.

"Electrical Noise and the Percolative Conduction in  $\text{LaCaMnO}_3$ ," A. Anane, B. Baquet and S. von Molnar, 2000 March Meeting of APS, Minneapolis, March 2000.

"Temperature Evolution of Magnetic Scattering in Half-Metallic Chromium Dioxide," S. Watts, S. Wirth, S. von Molnar, A. Barry and J. Coey, 2000 March Meeting of APS, Minneapolis, March 2000.

"Electron Tunneling Measurements on the CMR Perovskites," F. Sharifi, P. Xiong and S. von Molnar, Fall MRS, Boston, December 1999. (Invited)

"Quantitative Study of Nanoscale Contact and Pre-Contact Mechanics Using Force Modulation," S. Syed Asif, K. Wahl and R.J. Colton, Fall MRS, Boston, December 1999.

"Relationship Between Microstructure and Luminescent Properties of Epitaxially Grown  $\text{Y}_2\text{O}_3\text{:Eu}$  Thin Films on  $\text{LaAlO}_3$ ," H. Guo, S. Pennycook, D. Kumar and R.K. Singh, Fall MRS, Boston, December 1999.

"Low Temperature Growth of  $\text{BaSrTiO}_3$  by UV-Assisted PLD," V. Craciun, J. Howard, R.K. Singh and J. Perriere, Fall MRS, Boston, December 1999.

"Characteristics of  $\text{ZnO}$  Films Grown by UV-Assisted PLD," V. Craciun, J. Howard and R.K. Singh, Fall MRS, Boston, December 1999.

"Dielectric Passivation/Oxides on Compound Semiconductors," F. Ren, M. Hong, S.J. Pearton, C.R. Abernathy, G. Dang and J.R. Lothian, 46<sup>th</sup> Int. Symp. AVS, Seattle, Oct. 1999.

"Advanced Selective Dry Etching of GaAs/AlGaAs in High Density Inductively Coupled Plasmas," J.W. Lee, M. Devre, B. Reelfs, D. Johnson, J. Sasserath, F. Clayton and S.J. Pearton, 46<sup>th</sup> Int. Symp. AVS, Seattle, Oct. 1999.

"Comparison of Plasma Chemistries for Dry Etching of Ta<sub>2</sub>O<sub>5</sub>," K.P. Lee, K.B. Jung, R.K. Singh, S.J. Pearton, C.C. Hobbs and P. Tobin, 46<sup>th</sup> Int. Symp. AVS, Seattle, Oct. 1999.

"Effects of UV Illumination on Dry Etch Rates of NiFe-Based Magnetic Multilayers," H. Cho, K.P. Lee, K.B. Jung, Y.B. Hahn, S.J. Pearton and R.J. Shul, 46<sup>th</sup> Int. Symp. AVS, Seattle, Oct. 1999.

"High Breakdown Voltage (Au/Pt/GaN Schottky Diodes)," J.I. Chyi, J.M. Lee, C.C. Chuo, G.C. Chi, G. Dang, A.P. Zhang, X.A. Cao, M.M. Mshewa, F. Ren, S.J. Pearton, S.N.G. Chu and R.G. Wilson, 46<sup>th</sup> Int. Symp. AVS, Seattle, Oct. 1999.

"ICP-Induced Etch Damage of GaN p-n Junctions," R.J. Shul, A.G. Baca, L. Zhang, C.G. Willison, S.J. Pearton and F. Ren, 46<sup>th</sup> Int. Symp. AVS, Seattle, Oct. 1999.

"Schottky Diode Measurements of Dry Etch Damage in n- and p-type GaN," X.A. Cao, Z.P. Zhang, G. Dang, F. Ren, S.J. Pearton, R.J. Shul and L. Zhang, 46<sup>th</sup> Int. Symp. AVS, Seattle, Oct. 1999.

"Effect of N<sub>2</sub> Discharge Treatment on AlGaIn/GaN HEMT Ohmic Contact Using ICP," A.P. Zhang, G. Dang, X.A. Cao, F. Ren, S.J. Pearton, J.M. Van Hove, P.P. Chow, R. Hickman and J.J. Klaassen, 46<sup>th</sup> Int. Symp. AVS, Seattle, Oct. 1999.

"High Density Plasma Etching of Ta<sub>2</sub>O<sub>5</sub>-Selectivity to Si and Effect of UV Light Enhancement," K.P. Lee, h. Cho, R.K. Singh, S.J. Pearton, C. Hobbs and P. Tobin, MRS Fall Meeting, Boston, Nov. 1999.

"High Density Plasma Etching of (BaSr)TiO<sub>3</sub> and LaNiO<sub>3</sub>," K.P. Lee, K.B. Jung, A. Srivastava, D. Kumar, R.K. Singh and S.J. Pearton, MRS Fall Meeting, Boston, Nov. 1999.

"Ion Enhanced Dry Etching of Magnetic Multilayers: Post-Etch Cleaning and Effects of UV Illumination," H. Cho, K. Lee, K.B. Jung, S.J. Pearton, F. Sharifi and J. Marburger, MRS Fall Meeting, Boston, Nov. 1999.

"A Unified Approach to Modelling of Etched Profiles in an ICP Etching System," Y. Im, Y.B. Hahn and S.J. Pearton, 5<sup>th</sup> Intl. Workshop on Advanced Plasma Tools & Process Engineering, Santa Clara, CA, Feb. 2000.

"Corrosion-Free Dry Etch Patterning of MRAM Stacks – Effects of UV Enhancement," H. Cho, K.-P. Lee, K.B. Jung, S.J. Pearton, J. Marburger, F. Sharifi and J.R. Childress, 44<sup>th</sup> Ann. Conf. Magnetism and Magnetic Materials, San Jose, CA, Nov. 1999.

"Dry etching of MRAM Structures," S.J. Pearton, H. Cho, K.B. Jung, J.R. Childress, F. Sharifi and J. Marburger," 2000 Spring MRS Meeting, San Francisco, CA, April 2000.

"Low  $D_{IT}$  Dielectric/GaN MOS Systems," M. Hong, H. Ng, J. Kwo, A. Korkan, J. Baillargeon, S. Chu., J. Mannaerts, A.Y. Cho, F. Ren, C. Abernathy, S.J. Pearton and J.I. Chyi, 197<sup>th</sup> Meeting of the ECS, Toronto, May 2000.

"Magnetism Of Nanometer-Scale Iron Particle Arrays," S. Wirth MPI for Chemical Physics of Solids, Dresden, January 19, 1999.

"Magnetisierungsverhalten Regelmäßiger Anordnungen Von Ferromagnetischen Nanometerteilchen," S. Wirth, IMW Dresden (IFW), January 20, 1999.

"Magnetism Of Nanometer-Scale Iron Particle Arrays," S. Wirth, Laboratoire Louis Neel, CNRS Grenoble, January 25, 1999.

"Magnetism Of Nanometer-Scale Iron Particle Arrays," S. Wirth, CMRR (UCSD), San Diego, February 9, 1999.

"Magnetism of Nanometer-Scale Iron Particle Arrays," S. Wirth and S. von Molnár APS March Meeting 2000, Minneapolis, USA. (Invited)

"Experimental Determination of the Screening Length in Thin Magnetic Films," K. T. McCarthy, N. A. Theodoropoulou, A. F. Hebard (Department of Physics, Gainesville FL 32611-8440), Dorota Temple (MCNC, Electronics Technologies Division, Research Triangle Park, NC 27709-2889), APS March meeting (3/20-3/24).

"Growth-induced perpendicular anisotropy and clustering in  $Ni_xPt_{1-x}$  alloys." A. L. Shapiro, D. Vasumathi, B. M. Maranville, and F. Hellman, Conference presentation March APS (2000).

"Growth-induced anisotropy on vicinal substrates," B. M. Maranville, A. L. Shapiro, D. Vasumathi, and F. Hellman, Conference presentation March APS (2000).

"Ion-beam assisted growth of perpendicular anisotropy materials," D. Vasumathi, B. M. Maranville, and F. Hellman, Conference presentation March APS (2000).

"Sliding Transitions and Dissipation in Nanoscale Contacts," K.J. Wahl and S.A. Syed Asif, American Vacuum Society National Symposium, Seattle, WA, 25-29 October, 1999.

"Measuring and imaging contact stiffness quantitatively at the nanoscale using force modulation," S.A. Syed Asif, K.J. Wahl and R.J. Colton, American Vacuum Society National Symposium, Seattle, WA, 25-29 October, 1999.

"Quantitative Study of Nanoscale Contact and Pre-Contact Mechanics using Force Modulation," S.A. Syed Asif, K.J. Wahl and R.J. Colton, Materials Research Society Fall Meeting, Boston, MA, Dec 1999.

"Quantitative Nanoscale Surface Mechanical Properties of Polymers and Thin Films," K.J. Wahl, S.A.S. Asif, and R.J. Colton, SPM in Biomaterials Conference, Bristol, UK, June 23 2000. (Invited)

"Mechanics, Sliding Transitions and Dissipation in Nanoscale Contacts," K.J. Wahl, presented at Gordon Research Conference on Tribology, Holderness, NH, July 2000. (Invited)

"Nanoscale Surface Mechanical Properties of Polymer Thin Films and Organic Monolayers," K.J. Wahl, S.A.S. Asif, and R.J. Colton, 219<sup>th</sup> National Meeting of the American Chemical Society, San Francisco, CA, 26-31 March 2000. (Invited)

"Nanoscale Surface Mechanical Properties of Polymer Thin Films and Organic Monolayers," K.J. Wahl, S.A.S. Asif, and R.J. Colton, 220<sup>th</sup> National Meeting of the American Chemical Society, Washington DC, 20-24 August 2000 (Invited)

"Quantitative Imaging of Dynamic Mechanical Properties by Hybrid Nanoindentation," S.A. Syed Asif, K.J. Wahl, and R.J. Colton, American Vacuum Society National Symposium, Boston, MA, 2-6 October 2000.

"Force-modulated nanoindentation of fluorinated polymer thin films grown by PECVD," S.A. Syed Asif, E.J. Winder, K.K. Gleason, and K.J. Wahl, American Vacuum Society National Symposium, Boston, MA, 2-6 October 2000.

"Quantitative Study of Nanoscale Mechanical Properties of Nanostructures," S.A. Syed Asif, K.J. Wahl, and R.J. Colton Symposium T: Fundamentals of Nanoindentation and Nanotribology II, Fall MRS Conference, Boston, MA, 27 November-1 December 2000.

"Sliding Transitions, Mechanics and Dissipation in Nanoscale Contacts," K.J. Wahl, S.A.S. Asif, and R.J. Colton, Symposium T, Dynamics in Small Confining Systems VI, Fall MRS Conference, Boston, MA, 27 November-1 December 2000. (Invited)

"Flux Pinning in a Superconductor by an Array of Submicron Magnetic Dots," Ivan K. Schuller, Euroconference on Vortex Matter, Crete, Greece, September 18-24, 1999. (Invited)

"Dependence of the CPP-GMR on Spin-independent Scattering in Fe/Cr Superlattices," Tat-Sang Choy, Selman Hershfield, and Jian Chen, March Meeting of the American Physical Society, Minneapolis Minnesota, March 20-24, 2000.

"Database of Fermi Surfaces in Virtual Reality Modeling Language," Tat-Sang Choy, Jeffery Naset, Selman Hershfield, Christopher Stanton, and Jian Chen, March Meeting of the American Physical Society, Minneapolis Minnesota, March 20-24, 2000.

"Zero-bias Anomalies in Magnetic Hexaborides," Selman Hershfield and Valeri Kotov, March Meeting of the American Physical Society, Minneapolis Minnesota, March 20-24, 2000.

"Ion Beam Sputter Deposition of GMR Materials," G. E. McGuire, D. Temple, M. Ray, J. Lannon, and A.F. Hebard, invited talk at the Annual Symposium of the Mexican Vacuum Society, Mexico, 1999.

"Giant Magnetoresistive Films Grown by Ion Beam Sputter Deposition," G.E McGuire, D. Temple, J. M. Lannon, C.C. Pace, and M.A. Ray, invited talk to be presented at the International Workshop on Smart and Functional Film Deposition for VLSI Applications, November 2000, Nagoya, Japan.

## **Personnel Supported**

### **Year 1**

#### **Post-doctoral Associates and Visiting Researchers**

Vinay Ambegaokar, Visiting Professor with Dr. Hershfield  
Jose Martin, Visiting Scholar at UCSD  
Joseph Nagues, Visiting Scholar at UCSD

#### **Graduate Students:**

Kee Bum Jung with Dr. Pearton  
Cathy Vartuli with Dr. Pearton  
Juan Caballero with Dr. Childress  
Dan Park with Dr. Childress  
Yifeng Yang with Dr. Childress  
Heather Hudspeth with Dr. Sharifi  
Timothy Schultz with Dr. Sharifi  
Kingshuk Majumdar with Dr. Hershfield  
Tat Sang Choy with Dr. Hershfield  
Sean Jones with Dr. Holloway  
Jonathan Hack with Dr. Hummel  
Ed Price at UCSD  
Alex Shapiro at UCSD

#### **Undergraduate Students**

Greg Beck with Dr. Hershfield  
Regan Stradtman with Dr. Pearton

### **Year 2**

#### **Post-doctoral Associates and Visiting Researchers**

Jung-Sik Bang, Visiting Scientist with Dr. Holloway  
Xiao-ming Zhan, Visiting Scientist with Dr. Holloway  
Jian Chen, Post-doctoral Associate, with Dr. Hershfield  
Michael Coey, Visiting Professor at UCSD  
Aviad Frydman, Post Doctoral Fellow at UCSD  
M.-C. Cyrille, Post Doctoral Fellow at UCSD  
S. Kim, Post Doctoral Fellow at UCSD  
Jean Heremans, Post-doctoral fellow with Dr. von Molnar  
S. Wirth, Post-doctoral fellow with Dr. von Molnar

#### **Graduate Students:**

Kee Bum Jung with Dr. Pearton  
Jin Hong with Dr. Pearton  
Xianan Cao with Dr. Pearton  
Juan Cabbalero with Dr. Childress

Dan Park with Dr. Childress  
 Anthony Cabbibo with Dr. Childress  
 Heather Hudspeth with Dr. Sharifi  
 Timothy Schultz with Dr. Sharifi  
 Kingshuk Majumdar with Dr. Hershfield  
 Tat Sang Choy with Dr. Hershfield  
 Sean Jones with Dr. Holloway  
 Jonathan Hack with Dr. Hummel - Graduated with M.S., May 1997.  
 Shi-Dong Yu with Dr. Hummel  
 Ed Price at UCSD  
 A. Hoffman at UCSD  
 J. Choi at UCSD  
 B. Maranville at UCSD

### **Undergraduate Students**

David Hays with Dr. Pearton

### **Year 3**

### **Postdoctoral Associates and Visiting Researchers**

J.J. Heremans	Post Doctoral Fellow at FSU (now at EMCORE)
S. Wirth	Post Doctoral Fellow at FSU
J. Caballero	Post Doctoral Fellow at UF (now at UMich)
J. Chen	Post Doctoral Fellow at UF (now at Seagate)
H. Cho	Post Doctoral Fellow at UF
A. Frydman	Post Doctoral Fellow at UCSD
Michael Coey	Visiting Professor at UF
Y.B. Hahn	Visiting Professor at UF
Aviad Frydman	Post Doctoral Fellow at UF
M.C. Cyrille	Post Doctoral Fellow at UF
S. Kim	Post Doctoral Fellow at UF
Jian Chen	Post Doctoral Fellow at UF

### **Graduate Students**

K.B. Jung with Dr. Pearton  
 J. Hong with Dr. Pearton (now at Samsung)  
 X. Cao with Dr. Pearton  
 K. Lee with Dr. Pearton  
 Y. Park with Dr. Holloway  
 T. Feng with Dr. Childress  
 Y. Wu with Dr. Childress  
 H. Hudspeth with Dr. Sharifi  
 K. Majumdar with Dr. Hershfield  
 J. Lewis with Dr. Holloway

Ed Price with Dr. Hershfield  
 Alex Shapiro with Dr. Hershfield  
 A. Hoffman with Dr. Hershfield  
 B. B. Maranville with Dr. Hershfield  
 Ted O'Brien with Dr. Holloway  
 Jay Lewis with Dr. Holloway  
 Joe Thomes with Dr. Holloway  
 Heather D. Hudspeth with Dr. Sharifi  
 Kingshuk Majumdar with Dr. Hershfield  
 Tat-Sang Choy with Dr. Hershfield

### **Undergraduate Students**

D. Hays with Dr. Pearton  
 Stephanie Getty with Dr. Sharifi  
 Jonathan Marburger with Dr. Sharifi

## **Year 4**

### **Postdoctoral Associates and Visiting Researchers**

S. Wirth	Post Doctoral Fellow at FSU
H. Cho	Post Doctoral Fellow at UF
Y.B. Hahn	Visiting Professor at UF
M. Coey	Visiting Professor at FSU
Jian Chen	Post Doctoral Fellow at UF
Y. Park	Post Doctoral Fellow at UF (now at NRL)
J.I. Martin	Visiting Processor at UCSD
M. Velez	Visiting Processor at UCSD
J. Nogues	Visiting Processor at UCSD
J.L. Vincent	Visiting Processor at UCSD
J.-M. George	Visiting Processor at UCSD
E.M. Gonzalez	Visiting Processor at UCSD
Y. Jaccard	Post Doctoral Fellow at UCSD
M.C. Cyrille	Post Doctoral Fellow at UCSD
Aviad Frydman	Post Doctoral Fellow at UCSD
W. Teizer	Post Doctoral Fellow at UCSD
D. Kumar	Research Scientist at UF
Bernard Revaz	Visiting Scholar at UCSD

### **Graduate Students**

K.B. Jung with Dr. Pearton (now at IBM)  
 X. Cao with Dr. Pearton  
 K.P. Lee with Dr. Pearton  
 J. Mileham with Dr. Pearton (now faculty at U. Puerto Rico)  
 H. Hudspeth with Dr. Sharifi

J. Marburger with Dr. Sharifi  
 T.S. Choy with Dr. Hershfield  
 J. Lewis with Dr. Holloway  
 J. Thomes with Dr. Holloway  
 S. Pietambaram with Dr. Sharifi  
 G.T. Dang with Dr. Ren  
 T. O'Brien with Dr. Holloway  
 E. Price with Dr. Hershfield  
 A. Shapiro with Dr. Hershfield  
 A. Hoffmann with Dr. Schuller  
 S.V. Pietambaram with Dr. Singh  
 B. Maranville with Dr. Hellman  
 A. Shapiro with Dr. Hellman  
 Tat-Sang Choy with Dr. Hershfield

#### **Undergraduate Students**

S. Getty with Dr. Sharifi  
 T. Plew with Dr. Pearton  
 T. Kirk with Dr. Dynes

### **Year 5**

#### **Postdoctoral Associates and Visiting Researchers**

S. Wirth	Post Doctoral Fellow at FSU (now at the Max Planck Institute, Dresden, Germany)
H. Cho	Post Doctoral Fellow at UF
Y.B. Hahn	Visiting Professor at UF
M. Coey	Visiting Professor at FSU
Jian Chen	Post Doctoral Fellow at UF
Y. Park	Post Doctoral Fellow at UF (now at NRL)
J.I. Martin	Visiting Professor at UCSD
M. Velez	Visiting Professor at UCSD
J. Nogues	Visiting Professor at UCSD
J.L. Vincent	Visiting Professor at UCSD
J.-M. George	Visiting Professor at UCSD
E.M. Gonzalez	Visiting Professor at UCSD
P. Prieto	Visiting Professor at UCSD
Y. Jaccard	Post Doctoral Fellow at UCSD
M.C. Cyrille	Post Doctoral Fellow at UCSD
Aviad Frydman	Post Doctoral Fellow at UCSD
W. Teizer	Post Doctoral Fellow at UCSD
A.S. Katz	Post Doctoral Fellow at UCSD
Axel Hoffmann	Post Doctoral Fellow at UCSD
D. Kumar	Research Scientist at UF
Bernard Revaz	Visiting Scholar at UCSD

## **Graduate Students**

D. Kent with Dr. Pearton  
X. Cao with Dr. Pearton (now at Alpha Photonics)  
K.P. Lee with Dr. Pearton  
D.C. Hays with Dr. Pearton (now at Sony Corporation)  
H. Hudspeth with Dr. Sharifi (now at GE)  
J. Marburger with Dr. Sharifi  
T.S. Choy with Dr. Hershfield  
S.A. Getty with Dr. Sharifi  
S. Khan with Dr. Sharifi  
J. Howard with Dr. Singh  
G.T. Dang with Dr. Ren  
E. Price with Dr. Hershfield  
B. Shapiro with Dr. Hershfield  
Zhihong Chen with Dr. Hershfield  
Tat-Sang Choy with Dr. Hershfield  
B. Hoffmann with Dr. Schuller  
S.V. Pietambaram with Dr. Singh  
B. Maranville with Dr. Hellman  
B. Shapiro with Dr. Hellman  
N. Theodoropoulou with Dr. Hebard  
K.T. McCarthy with Dr. Hebard  
Casey Pace with Dr. Temple (a student at the Department of Physics of the  
University of North Carolina in Chapel Hill)

## **Undergraduate Students**

T. Plew with Dr. Pearton  
T. Kirk with Dr. Dynes

## Degrees Awarded

### Year 3

Juan Caballero	Ph.D. University of Florida 1997 "Growth and Characterization of Thin Films of NiNnSb and Its Application to Magnetoresistive Multilayer Structures"
Tao Feng	MS University of Florida 1998 "Magnetic and Magneto-Transport Properties of Amorphous CoFeB Spin Valve Multilayer Films"
Jin Hong	Ph.D. University of Florida 1998 "High Density Dry Etching – Mechanisms"
S.L. Jones	Ph.D. University of Florida 1998 "PLD of Y <sub>2</sub> O <sub>3</sub> :Eu Cl Phosphors for Flat Panel Displays"
Jewon Lee	Ph.D. University of Florida 1997 "Comparison of High Density ECR and ICP Plasma Sources for Etching of Electronic Materials – New Etch Regimes"
Yun Park	MS University of Florida 1997 "Fabrication and Characterization of Nanometer-sized Magnetic Particles"
T. Schultz	MS University of Florida 1997 "Novel Techniques for Nanowire Fabrication"
Juan-Juan Wang	MS University of Florida 1998 "High Density Plasma Etching of LaCuMnO <sub>x</sub> "

### Year 4

Yun Daniel Park	Ph.D. University of Florida 1998 "Fabrication and Characterization of Anisotropic MR and GMR Structures at Reduced Dimensions"
K.B. Jung	Ph.D. University of Florida 1999 "High Density Plasma Etching of Magnetic Materials"
J. Mileham	Ph.D. University of Florida 1999 "Characterization of GaSb Grown Under Microgravity Conditions by LEMZ"

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| D.C. Hays    | MS University of Florida 1999<br>"Selective Etching of Compound Semiconductors"  |
| D.S. Bitting | MS University of Florida 1998<br>"Aspect Ratio Dependent Etching of SiO <sub>2</sub> in HDP Systems for Submicron Applications"                              |
| S.T. Molloy  | MS University of Florida 1998<br>"The Oxidation of TiN in O <sub>2</sub> Plasma Photoresist Stripping Processes"   |
| T.M. Ake     | MS University of Florida 1998<br>"Ohmic Contacts"  |
| K. Majumdar  | Ph.D. University of Florida 1999<br>"Study of Transport Properties in Magnetic Nanostructures"   |
| A. Hoffmann  | Ph.D. University of California – San Diego<br>"Fundamental Studies of Magnetism"   |
| A.S. Katz    | Ph.D. University of California – San Diego<br>"Fabrication, Characterization and Analysis of Nanofabricated Ion Damage High Temperature Josephson Junctions" |

## Year 5

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|------------------|--|
| Heather Hudspeth | Ph.D. University of Florida 2000<br>"Electron Tunnelling Measurements on Ferromagnetically-Doped Lanthanum Manganite Films"                  |
| K.B. Jung        | Ph.D. University of Florida 1999<br>"High Density Plasma Etching of Magnetic Materials"  |
| A. Srivistava    | M.S. University of Florida 1999<br>"Growth and Characterization of BaSeTiO <sub>3</sub> Films with Enhanced Electrical Properties using PLD" |
| D.C. Hays        | MS University of Florida 1999<br>"Selective Etching of Compound Semiconductors"  |
| X.A. Cao         | Ph.D. University of Florida 2000<br>"Advanced Processing for Novel Devices"  |
| K.P. Lee         | MS University of Florida 1999  |

“Dry Etching of Novel Dielectric Films”

K. Majumdar

Ph.D. University of Florida 1999

“Study of Transport Properties in Magnetic Nanostructures”

A. Hoffmann

Ph.D. University of California – San Diego 1999

“Fundamental Studies of Magnetism”

A.S. Katz

Ph.D. University of California – San Diego 1999

"Fabrication, Characterization and Analysis of Nanofabricated Ion  
Damage High Temperature Josephson Junctions"

## **Book Chapters**

"Dry Etching of Magnetic Materials," K.B. Jung, H. Cho and S.J. Pearton, in Advanced Plasma Processes, ed. R.J. Shul (Springer-Verlag, Berlin, 1999).

## **Patents**

"Method of Manufacturing Photoluminescing Semiconductor Materials Using Lasers", Patent No. 5,597,621; Date Granted: January 28, 1997.

"Method for Altering the Magnetic Properties of Materials by Spark Processing", Filed November 27, 1996.

## **Honors/Awards**

Dr. Sharifi obtained the Teaching Incentive Program award from the University of Florida.

Dr. Holloway obtained the Professional Excellence Program award from the University of Florida.

Dr. Holloway obtained the Research Foundation Professorship award from the University of Florida.

Dr. Pearton was awarded Fellowship in ECS (1996) and IEEE (2000).

Prof. Dynes became Chancellor of UCSB.